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GEOLOGY and HISTORY of OIL PRODUCTION in the DECATUR - MT. AUBURN - SPRINGFIELD AREA, ILLINOIS


by

Lester L. Whiting

DIVISION OF THE
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JOHN C. FRYE, *Chief* URBANA

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ABSTRACT

"Fracturing" of the Sun Oil Company No. 1 Damery in December 1953 stimulated drilling 373 new holes in the Decatur-Mt. Auburn-Springfield area during 1954 and 1955. The resulting 164 wells added 1,710,000 barrels of produced oil and estimated reserves of 5,250,000 barrels of oil recoverable under present methods of production.

Oil reservoirs are in rocks of Devonian and Silurian age and are directly related to unconformities between the Devonian and Silurian and at the base of the New Albany shale. The particular local geologic conditions responsible for production in each pool in the area are given. Through 1955, fifteen pools related to the unconformities have been developed in the area. Three others in the region also are discussed briefly.

On July 6, 1953, the Sun Oil Company completed its No. 1 J. F. Damery in the SW 1/4 SW 1/4 SW 1/4 sec. 5, T. 15 N., R. 1 E., Macon County, for 10 1/2 barrels of oil a day through 112 perforations, between 1920 and 1950 feet in Silurian limestone. This was the discovery well of the Blackland pool. Production was averaging between 3 and 4 barrels a day by the end of November. The well was "fractured" December 28, 1953. Treatment consisted of injection of 448 barrels of fluid with 10,000 pounds of sand in 76 minutes, followed by the additional injection of 5,000 gallons of acid. Forty-eight hours later the well was flowing at the rate of 720 barrels a day (30 barrels an hour), and by December 31, 1955, it had produced over 40,000 barrels of oil.

The completion of this well ushered in a new era for the Decatur-Mt. Auburn-Springfield area. Two hundred and eighteen holes were drilled during 1954 and 155 during 1955, resulting in 164 new producers.

The geologic relationships accounting for the accumulation of oil in this vicinity and the statistical details of subsequent development are discussed briefly below.

REGIONAL SETTING

The area here designated as the Decatur-Mt. Auburn-Springfield area is located in Christian, Macon, and Sangamon counties, very nearly in the geographical center of Illinois. Springfield is at the western boundary and Decatur near the eastern boundary of the area. Mt. Auburn, which is about the center of the 1954 development, is almost midway between these two cities. The area lies mainly in the east-central part of the level portion of the Illi-

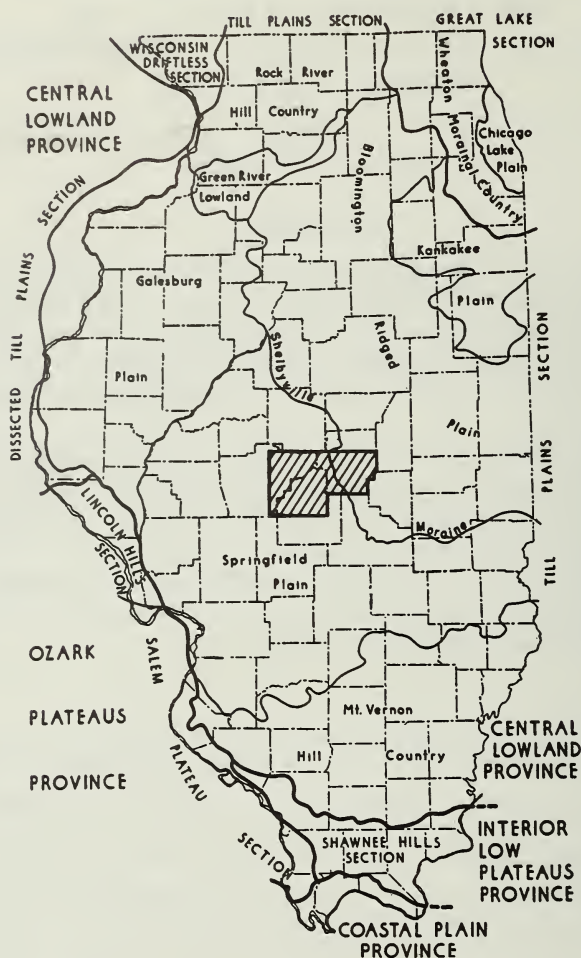


Fig. 1. - Index map showing area of this report in relation to physiographic provinces.

noian drift sheet known as the Springfield Plain physiographic province. The Shelbyville moraine, a line of low hills consisting of glacial materials deposited at the edge of the Wisconsin ice sheet, crosses the eastern part of the area about ten miles west of Decatur. A part of the Bloomington Ridged Plain province, which lies to the east of the moraine, is included in the area (fig. 1). It is a relatively flat to slightly rolling till plain with well defined drainage channels of rather low relief.

Topographic elevations range from 510 feet above sea level on the Sangamon River bottom north of Springfield to about 700 feet on the uplands at Decatur. Local relief in general is less than 75 feet but does reach approximately 100 feet along the Sangamon River near Decatur.

The major structural depression that includes most of Illinois, southwestern Indiana, and northwestern Kentucky is known as the Eastern Interior Basin. It generally is defined as that portion of these three states covered by sedi-

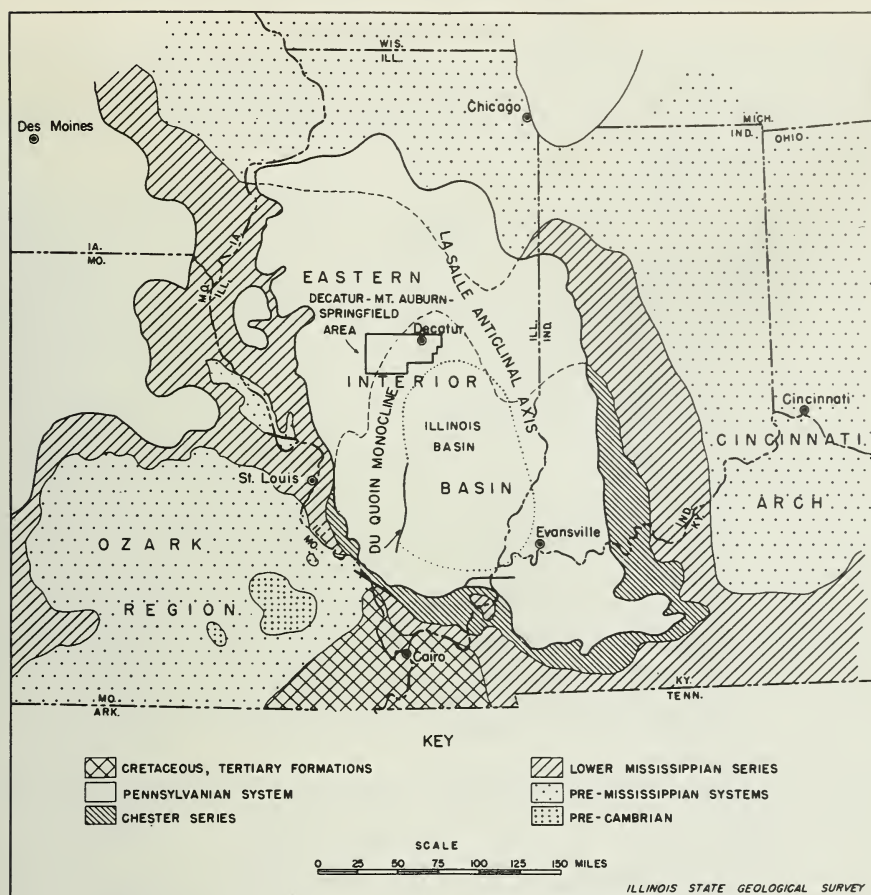


Fig. 2. - Location of the Decatur-Mt. Auburn-Springfield area in relation to areal geology and regional structure.

ments of Pennsylvanian age. The structurally deeper portion of this area is located in southeastern Illinois and has been designated as the Illinois Basin (Bell, 1941). The Decatur-Mt. Auburn-Springfield area lies on the shelf portion of the Eastern Interior Basin about 50 miles from the western edge. It is just northwest of the Illinois Basin (fig. 2).

The direction of the regional dip over the area as a whole is toward the southeast, although it varies from an east-southeast direction at the western edge to a more southerly direction at the eastern boundary (fig. 3).

The main structural feature of the region, as indicated by mapping on the Silurian limestone, appears to be a large monocline trending east-northeast south-southwest. Locally there are noses, sometimes with minor closure, extending for a short distance southeastward from the main feature. The Edinburg West pool is located on one of the larger noses (fig. 3). The Assumption Consolidated pool, not shown on the map, is on a similar structure.

GEOLOGIC POSITION

The Sun Oil Company's Damery well was drilled to a total depth of 3778 feet, deep enough to test all horizons down to the Prairie du Chien. This is by far the deepest well in the area. A summary of the more significant index markers is given below.

	Thickness (feet)	Depth (feet)
Pleistocene	85	
Pennsylvanian	677	
Shoal Creek limestone		88
Piasa limestone		278
Herrin (No. 6) coal		333
Springfield (No. 5) coal		370
Mississippian	1152	
Barlow limestone		762
Cypress sandstone		808
"Benoist" sandstone		none
Aux Vases sandstone		904
Ste. Genevieve limestone		950
Rosiclare sandstone		959
Chouteau formation		1760
New Albany formation (in part Devonian)		1800
Devonian		
Cedar Valley limestone		none
Silurian	381	1914
Ordovician	1483+	
Maquoketa shale		2295
"Trenton" limestone		2473
St. Peter sandstone		2910
Shakopee dolomite		3115

Pleistocene

Sediments of Pleistocene age are represented by unconsolidated surface sands, gravels, and boulder clays, most of which were deposited like a blanket over the older bedrock surface. They were brought here by the great ice sheet that crept down from Canada, bringing with them much material foreign to Illinois. Especially noticeable in this respect are the glacial boulders common in the Shelbyville moraine around Decatur. Pleistocene sediments vary in thickness from less than 5 feet on the upland, T. 15 N., R. 4 W., near New City, to over 200 feet in other parts of the area. The variation is due in great part to the filling with glacial debris of preglacial valleys that were tributaries of the ancient Mahomet-Teays river system.

Pennsylvanian

The Pennsylvanian system is characterized by silty or sandy shales, a few thin limestone and coal markers, and an occasional locally developed sandstone

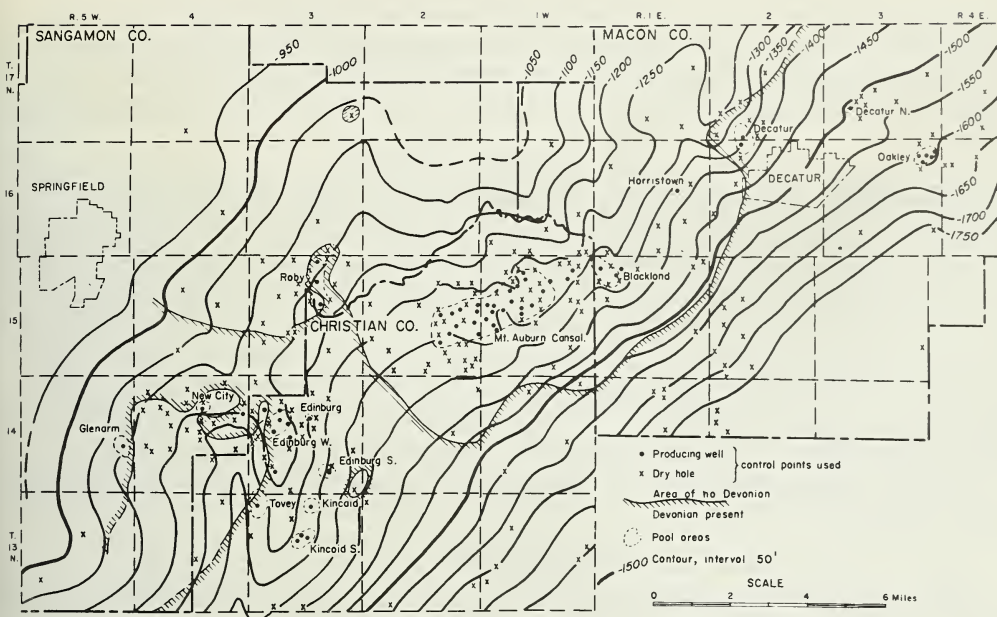


Fig. 3. - Regional map of the area showing pre-New Albany paleogeology and structure contours on the top of the Silurian.

Only the No. 6 and No. 5 coals, which are economically significant within the area, and the Shoal Creek and Piasa limestones, which are often used as key markers, are described in this report.

Shoal Creek limestone. - The Shoal Creek limestone is the most persistent shallow marker. It is gray to light gray, sometimes mottled, fossiliferous, and nodular. Individual beds vary from 2 inches to 3 feet or more in thickness with the total sequence being from 5 to 25 feet thick. It lies under about 200 feet of cover in the eastern part of the area but crops out along the western side, where it has been quarried for agricultural purposes. It averages less than 100 feet in depth over extensive portions. The Shoal Creek has been the objective for core drilling in this area.

Piasa limestone. - The Piasa limestone is of minor importance, but in the northernmost part of the area, where the Shoal Creek limestone is erratic or absent and the No. 6 coal generally is not recognizable, this unit has been a useful key bed. The Piasa lies about 60 feet above the No. 5 coal bed, which is most prominently developed in this same area. The Piasa is commonly fossiliferous and greenish gray. Characteristically, it is underlain by red, greenish-gray, and dark gray mottled shale. In some places, such shale also may occur above it. Where best developed, the limestone is 2 to 5 feet thick.

Herrin (No. 6) coal. - The Herrin (No. 6) coal has been the most useful Pennsylvanian key bed in much of southern Illinois. It is well developed in the southern part of the Decatur-Mt. Auburn-Springfield area and has been mined extensively near Taylorville. In general, it is not known to occur in minable thickness in this area north of T. 14 N., and in places is so poorly developed

that only its approximate position can be estimated in drill holes. It is normally 275 to 350 feet below the Shoal Creek limestone, although the interval is somewhat thinner in the northern part of the area. The coal is very commonly overlain by 5 to 10 feet of dark gray massive fossiliferous Herrin limestone.

No. 5 coal. - The No. 5 coal lies from 20 to 30 feet below the No. 6 coal, although locally the interval may be greater. In general, it attains minable thicknesses where the No. 6 coal is thin, but both are present in commercial thickness in parts of T. 14 N. To the south, the zone is generally recognizable in drill records, but the coal is for the most part thin. In the northern part of the area, this coal probably is the most reliable shallow key bed. It has been very extensively mined in the vicinity of Springfield, at Niantic and Decatur, and in the area at Moweaqua in which the No. 6 coal is absent because of a sandstone "cut out." The No. 5 coal lies from 150 to 275 feet deep in the vicinity of Springfield, 350 feet at Niantic, and about 625 feet at Decatur.

Further information on coal resources is given in the report by Cady and others (1952).

Mississippian

The contact between Mississippian and Pennsylvanian sediments is marked by an important angular unconformity. Consequently, Pennsylvanian rocks rest on progressively older Mississippian beds toward the north. Locally there are some well-defined pre-Pennsylvanian drainage channels superimposed on the older Mississippian surface.

Upper Mississippian (Chester)

The youngest Mississippian beds encountered in the southeastern portion of the area are in the Menard. To the northwest the Ste. Genevieve limestone lies directly below the Pennsylvanian.

The first good marker, where present, is the Glen Dean limestone. Lithologically, it is gray to buff or brown, fine to coarse crystalline, in places dolomitic, and cherty. It is indicated on the electric log as being 10 feet thick or less.

The best Chester marker in the eastern and southeastern part of the area is the Barlow limestone. It is normally about 25 feet thick and consists of an upper 5-foot brownish-gray fossiliferous zone, a middle 15-foot cherty zone, and a lower gray bed. Electrically, it is characterized by medium readings on both the self-potential and resistivity curves.

The Cypress and Benoist sandstones are absent over much of the area, the former both by reason of nondeposition and removal during post-Mississippian pre-Pennsylvanian erosion, and the latter almost entirely because of nondeposition. Where present, the somewhat sinuous linear distribution pattern of the sandstones suggests channel or bar deposits. However, insufficient work has been done on this problem to warrant specific conclusions.

Where well developed, either of these sandstones may include as much as 30 feet of fine to submedium generally quite clean white sandstone. To date, neither have been productive within the area, but the Benoist produces both at the Assumption Consolidated pool, T. 13 N., R. 1 E., and the Pana pool, Ts. 11 and 12 N., R. 1 E.

The Aux Vases sandstone almost always is present in good thickness. It is a very fine light-gray sandstone varying in thickness from less than 20 feet to about 40 feet. It has not been productive within the area. Nearest production lies several miles to the southeast in Shelby County but is very mediocre.

Valmeyer and Kinderhook

The lower 1000 to 1200 feet of Mississippian sediments is divided into two series, the Valmeyer above and the Kinderhook below. The former is predominantly a limestone sequence 900 to 1000 feet thick, whereas the latter, except for the thin Chouteau limestone at the top, is shale. Formation boundaries within this sequence are somewhat uncertain, and only those members used as markers are discussed here.

The uppermost member of the Ste. Genevieve, which is the top formation of the Valmeyer, is a 5- to 10-foot bed of brownish-gray limestone, glauconitic in many places, and containing both fine and coarse crystals. The immediately underlying Rosiclare member of the Ste. Genevieve is a sandstone and shale section which varies considerably, both in thickness and in relative percentages of shale, sandstone, or calcareous sandstone present. Where thin, the zone may be represented only by fine or very fine calcareous sandstone or very sandy limestone that at places contains cherty nodules. Sections of medium thickness may be somewhat calcareous sandstone at the top, grading to cleaner fine- to medium-grained sandstone, sometimes with greenish shale at the base.

A section nearly 80 feet thick is indicated in a few tests. In such cases, there may be a well-developed 10- to 20-foot shale section near the middle, and good sandstone bodies composed of fine to coarse loosely cemented grains both above and below. The sandstone portions of the section generally are indicated on electric logs by relatively high self-potential and very low resistivity readings. No production has been obtained from this horizon within the area, but it does produce in the Assumption Consolidated pool just to the southeast.

By far the best marker within the lower shale portion of the Mississippian is the Chouteau limestone. In the Damery well it lies below some 70 feet of mottled greenish-gray and red or brown generally fossiliferous shale. The Chouteau is a pure light olive-gray to white, dense or sublithographic limestone overlying some 200 feet of shale. Its position within a predominant shale section makes it readily identifiable on electric logs, where it is normally indicated by a 10- to 15-foot zone of medium to high resistivity with relatively low self-potential.

Perhaps the easiest strata to recognize from samples are the brownish-black shales of the New Albany, which occupy a zone approximately 200 feet thick just above the unconformity marking the top of the Silurian-Devonian limestone. These shales have a rather distinctive chocolate-brown color, a brown streak, and usually a rather greasy or waxy appearance and texture. In some portions of the section, especially toward the base, they become rather gritty, owing to the presence of very fine particles of dolomite. Sporangites, small round fossils thought to be plant spores, are very common and easily identified under the microscope. Electrically, this section is indicated by a light bulge in the resistivity curves but it is not clearly defined.

Devonian

The relationship between the base of the New Albany formation and the underlying sediments is one of unconformity, but the actual proof of unconformity may be very difficult to establish at any specific location. At best, the horizon may be indicated only by an inch or two of hard, quartzitic sandstone, the Sylamore (Hardin) sandstone, with a heavy concentration of pyrite at the contact with the underlying sediments. In the area in general, however, the relationship is obvious. In the south and southeast, the New Albany shales overlies a sequence of limestones, sandy limestones, and, in places, sandstones of the Cedar Valley formation of Devonian age, totalling about 50 feet in thickness. The limestones are dark gray to grayish brown and generally very finely crystalline with included coarse fossils; some of the limestones have been partially altered to chert. The limestones are also quite dolomitic; dolomite is the major constituent in some wells. Scattered semirounded sand grains varying from fine to coarse are common throughout, and locally thin sandstone beds are developed. The thin sandstone and sandy dolomite beds represent the pay zone in the Kincaid, Kincaid South, and Edinburg South pools. The name "Hibbard pay zone" is introduced here to designate this zone of arenaceous beds within the Cedar Valley formation, to differentiate it from the Sylamore (Hardin) sandstone at the base of the New Albany shale. The name "Hibbard" is derived from the discovery lease of the Kincaid pool. It is not intended to be used as a formal stratigraphic term.

Toward the north and northwest, the shales rest on progressively older beds, with the result that near the northwestern boundary the entire Devonian limestone sequence and portions of the Silurian are absent. Cores of the Damery well show Silurian beds directly below the shale.

Electrically, the base of the New Albany is easy to establish because the minimum self-potential and resistivity readings of the shale are interrupted by higher readings for either or both, depending upon the lithology or fluid conditions encountered. Whether the underlying beds are of Silurian or Devonian age, however, is not always possible to determine without examining the samples.

The situation outlined above presents some very interesting local conditions, discussed in detail in the section on oil production.

Silurian

The Silurian at the Damery well is represented by 381 feet of limestones and dolomites. At the top is a 23-foot greenish-gray fine to medium crystalline limestone with many blue-gray chert nodules and wavy green shale partings. Proof of Silurian age is established by the presence of Clathrodictyon vesiculosum, a Silurian guide fossil. The next 130 feet is light gray or greenish-gray somewhat cherty dolomite, which contains oil near the top.

The bottom 228 feet, representing the Joliet, Kankakee, and Edgewood formations, is light gray to light brown mostly dense or sublithographic limestone with some red grains in the Joliet portion. The lowest 15 to 20 feet is quite cherty and contains some glauconite.

Ordovician

Ordovician sediments 1483 feet thick were penetrated in the Damery well. At the total depth of 3778 feet the bit was still drilling in beds of Ordovician age after having penetrated nine formations of the system. Only the four commonly used as oil-field markers are described in this report.

The Maquoketa, the top formation, is predominantly grayish-green shale, with some relatively thin olive-gray limestones and dolomites in the middle portion of the section.

The "Trenton," which includes all beds referred to the Galena, Decorah, and Platteville formations, is a series of gray to brown limestones, generally very finely crystalline or dense to sublithographic in character and containing minor amounts of chert. The upper 100 feet, within which production is found farther south, is fine to dense limestone in the top 20 to 30 feet and medium to coarse crystalline limestone in the remainder. Toward the base of the series, the limestones change to brown very finely crystalline dolomites. The basal 10 feet is somewhat shaly and contains scattered fine to medium sand grains. A sharp increase in resistivity readings, coupled with lesser but still important increases in the self-potential readings, indicate the break between the "Trenton" beds and the overlying Maquoketa shales.

St. Peter sandstone refers herein, as in the oil fields, to the sandstone of the overlying Glenwood formation as well as to the true St. Peter sandstone. The whole sequence in the Damery well is described as fine- to coarse-grained subangular to rounded white to light gray loosely cemented sandstone. This section is reflected on the electric log by very high self-potential readings, coupled with relatively low resistivities. The top, however, is not obvious because of the somewhat similar character of the overlying dolomite. The base is readily located because the underlying Shakopee has considerably lower self-potential and higher resistivity readings.

The upper 100 to 150 feet of the Shakopee dolomite varies in color from gray through brown to red. Farther down it becomes more uniformly light brown. Cherts, some of which are oolitic, persist throughout. Sandstone lenses, probably only a foot or two thick, are common in the upper 525 feet but become less prevalent with depth, being entirely absent at 3778 feet, the bottom of the hole.

GEOLOGIC HISTORY

The only production in this area to date has been from beds immediately associated with the unconformity at the base of the New Albany shale. Several interesting conditions result from this pre-New Albany period of erosion that bear directly on oil production.

At the close of the Silurian period, the Decatur-Mt. Auburn-Springfield area probably was higher than its surroundings. Whether or not it was actually above sea level, and subjected to serious erosion before being covered by sediments of Middle Devonian age, is debatable. Much time obviously elapsed between the deposition of the uppermost Silurian and the overlying Middle Devonian, during which extensive erosion could have taken place. As the Silurian rocks encountered directly below the Middle Devonian rocks are quite uniform in thickness, however, it appears that no appreciable erosion did take place in

the area during the time that the Lower and part of the Middle Devonian sequence was being deposited elsewhere.

Deposition was resumed during late Middle Devonian time, and a series of limestones, dolomitic limestones, sandy dolomites, and some thin sandstones aggregating at least 50 feet was laid down. At the close of Middle Devonian time, the most important event, so far as present-day oil production in this area is concerned, took place. The recently deposited sediments were uplifted and subjected to all the agencies of subaerial erosion. All rocks of Devonian age and considerable portions of those of Silurian age were entirely removed over large parts of the area. Circulating waters increased porosity by solution and also may have added to the porosity by further dolomitization or recrystallization. Rain and wind expended their energy against the surface, resulting in fragmentation of the rocks, sorting of the materials, and redeposition at other sites of the materials capable of transportation by these agents.

During late Upper Devonian time the seas again advanced over this part of Illinois. Loose materials were again reworked and redistributed, this time by sea waters. Some of the cavities formed by previous solution were filled or partially filled and probably some new solution cavities were formed. A thin quartzitic sandstone may be the only sedimentary record of this period in much of the area. As the waters became deeper, the black shales of the New Albany sequence were deposited over the entire area.

Millions of years have elapsed since the events described above took place. The remains of plants and animals that had been living at the time the New Albany was deposited were chemically changed into hydrocarbons. The weight of sediments deposited above the New Albany pressed these hydrocarbons into whatever porous spaces were available, and warping and folding of the rocks helped to concentrate them in small areas, which, if large enough, might be an oil field.

OIL PRODUCTION

The search for oil in the Decatur-Mt. Auburn-Springfield area has been in progress for nearly eighty years. The oldest test of which the State Geological Survey has any record was drilled in T. 16 N., R. 4 W., near Riverton, Sangamon County, in 1876. It was drilled to a total depth of 2004 feet by C. B. Swan, a "gas and oil prospector and artesian well contractor." This was deep enough to reach the "Trenton" limestone, thus actually penetrating all zones that are furnishing any oil in the area. It was a dry hole.

Decatur pool. - The first production for the area was in the Decatur pool. In 1921 the Lincoln Gas and Oil Company commenced operations at their No. Powers, located in sec. 5, T. 16 N., R. 2 E. Presumably, it was completed early in 1922, but the first recorded sale of oil was in late 1925. During the latter year this well produced 330 barrels of oil, and the pool (two wells) produced 490 barrels. The oil was purchased by Indian Refining Company for \$1.87 per barrel at the well. These early wells have long since been abandoned, and complete statistics on production are unavailable.

In 1953 the pool was revived when Harmon Oil Company completed the No. 1 Trump, also located in sec. 5, T. 16 N., R. 2 E., for 13 barrels of oil and 12 barrels of water a day. Six wells were producing on January 1, 1956, and total production for the pool was 10,157 barrels.

Production in the Decatur pool lies on the eastern flank of a north-south trending nose. No definite closure is indicated by present information, but if there is closure it would seem to center in sec. 18 or 19, T. 17 N., R. 2 E., northwest of present production. Devonian limestones 5- to 15-feet thick cover the entire productive area but are absent a mile or two to the northwest. Production is from porosity zones developed in beds of Devonian or Silurian age with all producers bottomed from 50 to 75 feet below the top of the Silurian. Initial production varied from 13 barrels to 90 barrels. Holes were either acidized or fractured and in most cases have been subjected to both treatments.

Mt. Auburn Consolidated pool. - The W. Marlow No. 1 C. Ralph in sec. 27, T. 15 N., R. 2 W., Christian County, was completed in March 1943 for 22 barrels of oil a day from the Silurian, the top of which was reached at 1895 feet. This was the discovery well of the Mt. Auburn pool and the first commercial producer in Christian County. Three other wells were completed in 1945, 1946, and 1947 for 10, 31, and 4 barrels of oil a day, respectively, but no active drilling program developed at that time.

Following the success by the Sun Oil Company in the Blackland pool in T. 15 N., R. 1 E., interest in surrounding parts of Christian and Macon counties was revived, and in March 1954 M. H. Richardson completed the No. 1 Millie Long in sec. 8, T. 15 N., R. 1 W., Christian County, for 138 barrels of oil a day, and H. F. Robison completed the No. 1 H. L. Tankersley in sec. 13, T. 15 N., R. 2 W., Christian County, for 303 barrels of oil a day. These were the discovery wells for the Mt. Auburn East and Mt. Auburn Central pools, respectively. These pools have been consolidated with the Mt. Auburn pool.

Geological Survey records show that as of December 31, 1955, a total of 87 producers had been drilled with 85 still producing. Accumulated production amounted to 597,574 barrels, 344,000 of which had been produced during 1955. Current estimates by the Survey staff indicate that this represents about one-fourth of the oil obtainable from the pool by present methods of production.

This pool lies in an area where the limestones were removed by pre-New Albany erosion. Production lies on the regional dip slope and is confined to a band about six miles long and two miles wide paralleling the strike of the beds. Accumulation of oil is in porous zones developed in Silurian limestones, with the concentration probably due both to the disappearance of porosity updip and the presence of a flattened or terrace-like structure. In all but two or three of the producing wells, the top of the Silurian limestone series was reached between 1250 and 1300 feet below sea level. Detailed contouring reveals the presence of small nose-like features with occasional very minor closures within the area of production. None of the closures seem to have any bearing upon the amount of production that may be obtained. Dry holes are scattered throughout the productive area, indicating that porosity plays a more important role than structure. Initial production for the wells varied between 5 and 80 barrels of oil a day, most holes being in the 50- to 150-barrel class. Nearly every well was acidized or fractured and most were subjected to both treatments.

Roby pool. - The first hole to produce any oil in the Roby area was the W. Taft No. 1 Taft completed in May 1945 for 4 barrels of oil and 20 barrels of water a day from the Rosiclare sandstone. Oil from this well was never obtained in commercial quantities but was used on local roads. The well

credited with being the discovery well of the Roby pool, the Perardi No. 1 Goldstein, sec. 10, T. 15 N., R. 3 W., Sangamon County, was completed in November 1949 for 16 barrels of oil and 9 barrels of water daily. Production was from porous zones in the Silurian dolomite. Subsequently two more holes were completed as very small producers. As of January 1, 1956, two wells were still reported as active. The Survey has no accurate record of the amount of oil obtained from the pool.

There is no evidence of closure in this vicinity. Production appears to be due entirely to accumulation in porous zones developed in the Silurian dolomites by pre-New Albany erosion. Structure is monoclinal with southeast dip of about 25 feet to the mile.

Edinburg pool. - Paul Doran and Associates completed the No. 1 Earl Heater in sec. 15, T. 14 N., R. 3 W., Christian County, in November 1949, for 8 barrels of oil a day. Several dry holes, including a direct east offset, subsequently were drilled, but the pool was abandoned in 1951, no more producer having been found. There is no record at the Survey of the amount of oil produced.

Oil accumulation at this well was in minor local porosity developed in Devonian and Silurian limestones. The well lies on the regional dip slope, which in this vicinity is toward the east at approximately 50 feet to the mile.

Blackland pool. - The Blackland pool was discovered in July 1953 by the Sun Oil Company when it completed the No. 1 J. F. Damery, sec. 5, T. 15 N., R. 1 E., Macon County, for 10 1/2 barrels of oil a day from a porous zone in Silurian dolomite. The well did not create much interest at the time and no doubt would soon have been forgotten, but in December the operators "fractured" the formation and recompleted the well for 350 barrels of oil a day. This touched off a drilling program that eventually covered the three-county area discussed in this report. There were 14 wells producing in the Blackland pool by the end of 1954, and one additional well was completed in 1955. Although early production was limited by lack of outlet facilities, 81,000 barrels of oil was produced in 1954, and accumulative production of 178,000 barrels was reported by the end of 1955. This is estimated to be about two-fifths of the oil that may be expected from these wells under present production methods.

The same conditions responsible for accumulation and production in the Mt. Auburn Consolidated pool pertain to the Blackland pool. Production here seems to be due to continuation along strike of porous zones present in the Mt. Auburn area, and it is quite likely that future drilling will show continuous production across secs. 10 and 11, thereby joining the two pools. Initial production for the wells varied between 4 and 350 barrels per day, 50 to 100 barrels being normal.

Decatur North pool. - The Welker Oil Company completed the No. 1 A. Boyd in sec. 29, T. 17 N., R. 3 E., Macon County, in April 1954 for 10 barrels of oil and 15 barrels of water a day, thereby indicating production possibilities northeast of Decatur. However, the well is credited with producing only 100 barrels of oil before being abandoned. As of January 1, 1956, no new tests had been drilled in this vicinity. This is unfortunate because no tests have been drilled updip to the west or northwest, and hence no definition of the porous zone containing the oil has been established.

Production was from porosity developed in the Silurian and overlying thin Devonian limestone. No structure is evident from present information.

Oakley pool. - The discovery well of the Oakley pool, the L. Walker No. 1 Hawkins, sec. 1, T. 16 N., R. 3 E., Macon County, also was completed in April 1954. Initial production was 6 barrels of oil and 18 barrels of water a day. Even though this was not a large well, considerable interest was generated as a result of the discovery. By the end of 1955, 6 wells in the pool had produced a total of 6,129 barrels of oil.

In this area 20 to 25 feet of Devonian limestones lie between the New Albany black shale and the underlying Silurian dolomite sequence. Porosity development within these limestones furnishes the reservoir for the oil being produced. Structural mapping shows only a slight nosing across the producing area, but the limits of production have not yet been defined and it is possible that minor closure may yet be revealed.

Harristown pool. - The lone producer in the Harristown pool was drilled by Dell Carroll on the A. F. Krall farm, sec. 14, T. 16 N., R. 1 E., Macon County. It was completed in September 1954 for an initial production of 65 barrels of oil a day from Silurian dolomite after fracture treatment. By the end of December 1955 production from this well amounted to over 3000 barrels.

This pool lies within the area from which all Devonian limestones had been removed during pre-New Albany erosion. Accumulation is in porous zones in the Silurian dolomites. The well is located on the normal regional southeast dip slope, here about 40 feet to the mile. No closure is indicated in the vicinity. The position on the dip slope and the fact that the Silurian sequence was found 1300 feet below sea level suggest that the porosity is in a continuation of the zone that produces oil in the Blackland and Mt. Auburn Consolidated pools.

No definition of the productive area has yet been established because there is only one dry hole within a radius of 1 1/2 miles. Considerable additional drilling appears warranted, especially on the updip side and along strike both to the northeast and southwest.

Edinburg West pool. - Work was started on the Arnold Valter No. 1 S. Riskell, sec. 17, T. 14 N., R. 3 W., Christian County, in April 1954. It soon became evident that the well was structurally high and that a producer probably could be obtained, but a legal technicality prevented its completion until October. The official initial production was 164 barrels of oil and 13 barrels of water a day. The delay allowed other companies to obtain holdings and start operations, with the result that subsequent development was very rapid. Thirty producers had been completed, and 599,339 barrels of oil had been obtained by December 31, 1955. This is estimated to be about thirty percent of the oil that can be recovered by present production methods from these wells.

The Edinburg West pool is on the northern end of a north-south trending nose that continues southward for several miles as a fairly prominent anti-clinal axis. Detailed mapping along this axis indicates closure of approximately 50 feet on the Devonian limestone and 20 feet on the top of the Silurian beds. Center of closure on the Devonian lies in the SE 1/4 sec. 17; that on the Silurian has not been completely defined but appears to be one-half to three-fourths of a mile to the south in the E 1/2 sec. 20.

Production in the pool lies across the top and around the northern and eastern flanks of the area of closure on the Devonian limestone. Devonian thickness here averages about 12 feet. Oil accumulation is primarily in porous zones within the Silurian dolomite, but some holes at the northern end of the pool have a few feet of oil-bearing Sylamore ("Hardin") sandstone at the base of the New Albany shale. Initial production varied between 7 and 700 barrels a day, with most of the wells producing 75 to 250 barrels.

Only two tests, both dry, have been drilled within the area of closure on the Silurian. One or two more holes appear necessary in the SE $\frac{1}{4}$ sec. 20 or the E $\frac{1}{2}$ sec. 29 to test this portion of the structure adequately.

New City pool. - Drilling in the Edinburg West pool stimulated activity over a rather considerable area. W. F. Wooters opened the New City pool in December 1954 with the completion of the No. 1 A. W. Robinson, sec. 10, T. 14 N., R. 4 W., Sangamon County. Initial production was 148 barrels of oil and 5 barrels of water a day. This was the only producer completed during 1954, and no oil was run in that year. Several holes were drilled in 1955, two of which were completed as producers. Accumulated production at the end of December 1955 amounted to 27,804 barrels.

Present drilling does not indicate the presence of structural closure in the vicinity. Here, as at Mt. Auburn, the Devonian limestones are absent, so the New Albany black shale directly overlies beds of Silurian age. Production is from porous zones in the Silurian, the top of which is between 1125 and 115 feet below sea level. Partial definition of the productive limits seems to be established to the north and south, but several additional holes are needed before the eastern and western boundaries can be determined.

Glenarm pool. - R. W. Schneider and Associates completed their No. 1 J. Warrington, sec. 24, T. 14 N., R. 5 W., Sangamon County, on June 21, 1955, for 11 barrels of oil and 15 barrels of water a day. This was the discovery well and only producer in the Glenarm pool. One dry hole has been drilled to the east, but no actual definition of the prospective area has been established. Production is from porous zones within the Silurian and has been of little significance to date. Top of the Silurian is 1673 feet.

Kincaid pool. - The L. A. McElmurray No. 1 G. B. Hibbard, sec. 3, T. 13 N., R. 3 W., Christian County, the discovery well of the Kincaid pool, was completed June 21, 1955. Initial production was 502 barrels of oil a day, reported to be from the Sylamore ("Hardin") sandstone. Later studies, however, reveal that the production is from sandy dolomite and thin sandstones lenses of the Hibbard pay zone of the Cedar Valley formation. The top of this sequence was reached at 1782 feet. Production lies on the eastern slope of the structural nose upon which the Edinburg West pool is located. The actual thickness of the Devonian is not known because none of the producers have penetrated completely. However, a dry hole updip pierced 35 feet of the Devonian before entering the Silurian. Present information is insufficient for determining the conditions responsible for the production in this position on the nose. It is believed, however, that the relationship to the regional disappearance of the Devonian limestones is more significant than the relationship to the Edinburg structure.

By the end of 1955, five producing wells had been completed, and 210,172 barrels of oil had been produced. No data on the geology were available.

Kincaid South pool. - The discovery well of the Kincaid South pool, the J. F. Hinkle No. 1 Blackstock Estate, sec. 15, T. 13 N., R. 3 W., Christian County, was completed on November 1, 1955, for an initial production of 416 barrels of oil daily from the Hibbard pay zone. This well is essentially along strike and about 1 1/2 miles south of producers in the Kincaid pool. Top of the Devonian limestone is 1816 feet. Geologic conditions responsible for production appear to be identical with those at the Kincaid pool. Twelve wells had been completed by the end of the year with a reported cumulative production of 75,146 barrels of oil. One of the wells had an initial production of 1,220 barrels of oil a day.

Tovey pool. - The Pollack Brothers No. 1 Strawkas, sec. 6, T. 13 N., R. 3 W., Christian County, was completed as the discovery well of the Tovey pool on November 22, 1955, for 105 barrels of oil a day. Top of the Devonian limestone was reached at 1836 feet and the Silurian was topped at 1848 feet. Production is from porous zones within the Silurian under conditions believed to be similar to those pertaining to production in the Edinburg West pool. No other wells had been completed in the pool by the end of the year.

Edinburg South pool. - The most recent discovery well for the area, the Lowell Ewart No. 1 N. C. Davis, sec. 26, T. 14 N., R. 3 W., Christian County, was completed December 6, 1955, for 85 barrels of oil a day from the Hibbard pay zone. The top of the Devonian carbonate rocks was 1791 feet.

Production results from a continuation northeastward, parallel with the strike of the beds, of the same geologic conditions that account for the oil at the Kincaid and Kincaid South pools.

SUMMARY

Oil activity in the Decatur-Mt. Auburn-Springfield area in 1954 and 1955 has been interesting and exciting, as well as of considerable commercial importance. In both time of development and geologic conditions reflected, the events can be divided into two phases.

Exploration and much of the development of the first phase took place prior to the end of 1954. Production from the wells drilled during 1954 and earlier was from porous zones within the Silurian dolomites, developed primarily as a result of pre-New Albany erosion. Many more wells must be drilled to locate all the oil from this type of accumulation, but the producing region is already fairly well indicated.

The second phase was initiated when the discovery well of the Kincaid pool was completed, and in December 1955 it was still in the exploratory stage. The accumulation here is at the regional updip margin of sandy dolomites and sandstone lenses developed within the Devonian limestones of the Cedar Valley formation. The present position of this margin was determined by post-Cedar Valley pre-New Albany erosion, but the reservoir rocks themselves were deposited during Cedar Valley time. These reservoir rocks are much more consistent in character and more likely to be persistent over a considerably larger area than the porous zones within the Silurian. Considerable optimism for the future of the area is, therefore, justified.

OTHER CHRISTIAN COUNTY POOLS

All the oil pools so far discovered in Macon and Sangamon counties lie within the area discussed. In Christian County, however, three pools lie south or

southeast of the area. To complete the report, therefore, pertinent data for these pools are noted here.

Assumption Consolidated pool. - The National Associated Petroleum Company completed the No. 1 C. G. Simcox Estate, sec. 29, T. 13 N., R. 1 E., Christian County, in October 1948 for 31 barrels of oil and 12 barrels of water a day. This well, which obtained its production from Devonian limestone of Cedar Valley age, was the discovery well of the Assumption pool and started development resulting in the first commercial oil production in Christian County. Two months later, National Associated Petroleum completed a second well, the No. 1 J. H. Lawrence, sec. 9, T. 13 N., R. 1 E., for 116 barrels of oil a day, also from Devonian limestone, the top of which was reached at 2282 feet. This was credited as the discovery well of the Assumption North pool. However, production soon indicated that these two pools would join, and in 1953 they were consolidated.

As of December 31, 1955, 171 wells had been completed as producers, 161 of which were still producing. Production for 1955 was 455,000 barrels, making a total of 5,042,000 barrels produced. It is believed that approximately 3,000,000 more barrels of oil will be recovered from these wells by present production methods.

Production is on a prominent anticlinal structure having a critical closure of approximately 50 feet. Oil has been obtained from three formations - the Bethel sandstone of Chester age, the Rosiclare sandstone of Ste. Genevieve age, and the Cedar Valley limestone of Devonian age. Cedar Valley sediments average about 55 feet thick in this pool and exhibit no thinning over the structure, indicating that the folding was post-Devonian.

Pana pool. - The first well in the Pana pool was completed by Collins Brothers on the R. T. Jones farm, sec. 3, T. 11 N., R. 1 E., Christian County, in May 1951. Initial production from the Bethel sandstone of Chester age was 20 barrels of oil and 20 barrels of water a day. Top of the pay sand was at 1472 feet.

A total of four wells had been completed by December 31, 1955, and accumulated production for the area amounted to 38,598 barrels, 8,000 of which was produced during 1955. This is believed to be about 65 percent of the production that may be expected from these wells.

Assumption South pool. - Discovery of this pool is credited to The Texas Company, which completed its No. 1 Kemmerer Orphanage, sec. 14, T. 12 N., R. 1 E., Christian County, in December 1951 for 26 barrels of oil and one barrel of water a day. Production is from the Cedar Valley limestone of Devonian age, which was topped at 2632 feet. Six additional tests, two of which made small producers, subsequently were drilled in an attempt to define the productive limits. This pool produced 2,000 barrels of oil during 1955 and had an accumulated production of 7,647 barrels of oil on January 1, 1956.

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OIL IN THE DECATUR-SPRINGFIELD AREA

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Pool	County	Sec.	T.	R.	Date of discovery	Producing formation	Depth (feet) to		Total depth (feet)	Initial production (bbls. per day)
							Devonian	Silurian		
Decatur ^a	Macon	5	16N	2E	9- 8-53	Devonian and Silurian	2006	2010	2052	13 oil; 12 water
Mt. Auburn Consol.	Christian	27	15N	2W	3-23-43	Silurian	-	1895	1906	22 oil
Mt. Auburn East	"	8	15N	1W	3- 9-54	"	-	1850	1886	138 oil
Mt. Auburn Central	"	13	15N	2W	3-16-54	"	-	1864	1885	303 oil
Assumption Consol.	"	29	13N	1E	10-12-48	Devonian ^b	2327	2382	3070	31 oil; 12 water
Assumption North	"	9	13N	1E	12-21-48	"	2282	-	2310	116 oil
Roby ^c	Sangamon	10	15N	3W	11- 1-49	Silurian	1761	1770	1818	16 oil; 9 water
Edinburg	Christian	15	14N	3W	11-15-49	Devonian and Silurian	1787	1812	1853	8 oil
Pana	"	3	11N	1E	5-15-51	Bethel	2733	2812	2847	20 oil; 20 water
Assumption South	"	14	12N	1E	12-31-51	Devonian	2632	2702	2740	26 oil; 1 water
Blackland	Macond	5	15N	1E	7- 7-53	Silurian	-	1913	3780	10½ oil ^e
Decatur North	Macon	29	17N	3E	4-27-54	Devonian and Silurian	2184	2185	2240	10 oil; 15 water
Oakley	"	1	16N	3E	4-27-54	Devonian	2287	-	2309	6 oil; 18 water
Harristown	"	14	16N	1E	9-21-54	Silurian	-	2050	2080	65 oil
Edinburg West	Christian ^f	17	14N	3W	10-26-54	Sylamore and Silurian	1669	1682	1694	164 oil; 13 water
New City	Sangamon	10	14N	4W	12- 7-54	Silurian	-	1731	1743	148 oil; 5 water
Glenarm	"	24	14N	5W	6-21-55	"	1653	1673	1720	11 oil; 15 water
Kincaid	Christian	3	13N	3W	6-21-55	Devonian	1782	-	1805	502 oil
Kincaid South	"	15	13N	3W	11- 1-55	"	1816	-	1826	416 oil
Tovey	"	6	13N	3W	11-22-55	Silurian	1836	1848	1881	105 oil
Edinburg South	"	26	14N	3W	12- 6-55	Devonian	1791	-	1809	85 oil

^a See discussion of Decatur pool area.^b Bethel & Rosiclare sandstones also produce within pool area.^c See discussion of Roby pool area.^d

Producing area extends into Christian County.

^e

Later reworked and completed for 350 barrels of oil.

^f

Producing area extends into Sangamon County.



CIRCULAR 211

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